

Sand Reclamation System

"Cunningham Foundry's operation required us to dispose of 2,500 tons of used sand per year into area landfill sites. We were concerned about rapidly increasing waste disposal costs. With our Gudgeon Brothers Thermfire 3000 sand reclaimer we saw an opportunity to reduce our costs for sand purchases and disposal and also help to prolong the life of local landfills. The project has lived up to our expectations and appears to have been a win situation for all parties."

Robert Mallard
President
Cunningham Foundry & Machine Co. Ltd.
St. Catharines, Ontario

THE CHALLENGE

The foundry industry uses sand combined with a chemical binder to form the molds used in the making of iron castings. Once the casting has been made the sand mold is broken away.

This sand is coated with binder and 20% cannot be used again. To do so would result in an end product of unacceptable quality. Disposing of this sand and replacing it costs about \$80 a tonne.

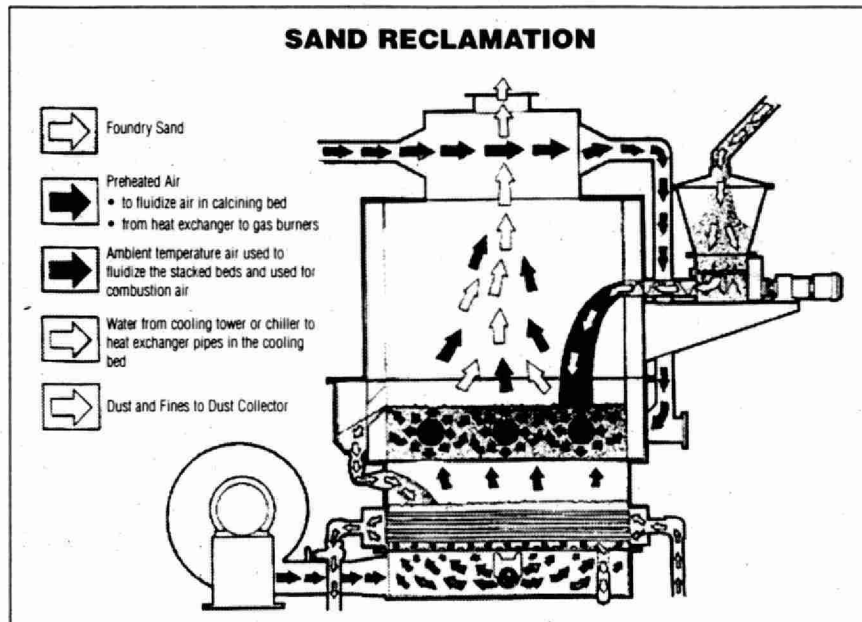
Cunningham was spending more than \$180,000 annually to send nearly 2,300 tonnes sand to landfill sites.

The expectation of these costs rising encouraged Cunningham to find an economically and environmentally favorable alternative.

TECHNOLOGY

In 1991, Gudgeon Brothers Limited of London, Ont. installed its Thermfire energy-efficient, natural gas-fired, thermal sand reclamation system in Cunningham Foundry.

The Thermfire system removes residual binder and increases the amount of sand which can be reused. The basis of the Thermfire system is the stacked fluidized beds. The upper bed is used for calcining or burning



Gudgeon Brother's Thermfire Unit Flow Schematic

the sand. The lower one is used for cooling.

The sand enters the upper bed and becomes fluidized when air is forced upwards through the sand causing it to float around the submerged stainless steel alloy burner tubes. The direct contact between the combusted gases and sand quickly heats it to 677°C (1,250°F). After 25 to 30 minutes in this chamber, the binder is completely burned from the surface of the sand.

The sand then flows to the lower chamber where it is cooled to 27°C (80°F) and taken by a conveyor to a storage hopper for reuse.

The Thermfire unit is completely automated. It has a programmable logic controller (PLC) and is designed to run without a dedicated operator on a 24-hour basis. To ensure the safety of the plant and its employees, the unit is equipped with automatic shut down sequences.

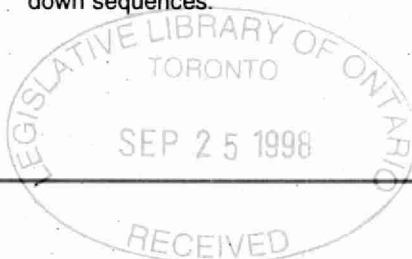
RESULTS

Cunningham is satisfied with the system's operation and reliability. Further, the company believes that the quality of the reclaimed sand is equal to that of new sand.

Testing showed that the molds made from reclaimed sand would produce acceptable castings.

- * The Loss on Ignition (LOI) test measures the amount of residual binder or volatiles that is released in the form of gas when the molten metal is added to the mold. The reclaimed sand from the Thermfire unit has a LOI of 0.1 per cent which is well below the LOI limit of three per cent.
- * The sieve tray analysis determined that the AFS No. for the average grain size was 51.26 - that of new sand used at Cunningham Foundry is 49 to 51, with the upper limit being 54-55.

Finally, testing of the exhaust showed that the unit's emissions meet Ontario's environmental regulations.



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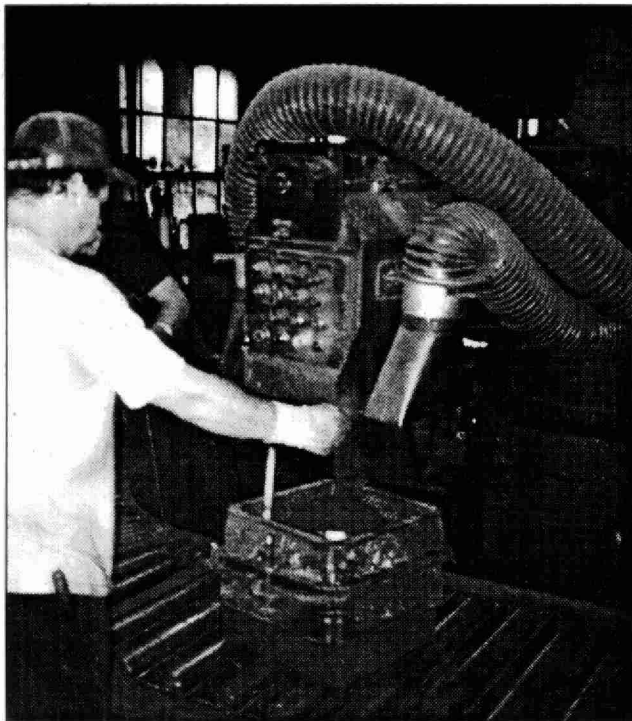
BENEFITS

The unit includes a number of energy efficient system designs which reduce operating costs including:

- * uses low cost natural gas;
- * the combustion air for the burner tubes is preheated by the stack gases;
- * the binder itself is combusted in the process;
- * the sand entering the upper calcining bed is preheated by the air from the lower cooling bed;
- * fewer moving parts means less maintenance.

Also, the reclaimed sand may have properties that are better than those of new sand. For example:

- * it contains no volatiles or waste products which means that when the sand is heated, it shrinks less;
- * the sharp grain edges are removed allowing a more uniform meshing of the sand in the mold;
- * the sand is thermally stabilized which prevents the mold from distorting during the casting process.



Sand is used to form molds for iron castings

Projected annual savings are between \$78,000 and \$156,000, with a simple payback of three to six years.

Any foundry which uses chemically-bonded sands and wants to reduce its sand disposal and replacement costs could take advantage of this system.

Gudgeon Brothers has improved this unit. It now has a spark ignition system instead of a pilot system and the gas supply to all four burners is controlled by one valve train instead of four. These changes reduce the capital and operating cost.

PARTNERSHIP IN POLLUTION PREVENTION AND RESOURCE CONSERVATION

Industrial companies located in Ontario may seek ministry/industry services that will help them to:

- * use energy and water more efficiently;
- * reduce, reuse and recycle solid waste;
- * reduce or eliminate liquid effluent and gaseous emissions;

Equipment and services supply companies can benefit from the information provided on technologies identified for business development.

FOR FURTHER INFORMATION, PLEASE CONTACT:

Robert Mallard, President
Cunningham Foundry & Machine Co. Limited
21 Yale Cres., St. Catharines, Ontario L2R 2Y6
Tel: (905) 685-6577

Gabriela Teodosiu, Industry Conservation Branch
Ministry of Environment and Energy
2 St. Clair Ave. W., 14th Floor
Toronto, Ontario M4V 1L5
Tel: (416) 327-1253
Fax: (416) 327-1261

MINISTRY OF ENVIRONMENT AND ENERGY SERVICES

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